CLAIMS

(1) A wireless packet communication method transmitting a data packet between two STAs capable of using plural radio channels, by using a radio channel that is judged idle by carrier sensing, characterized by:

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

transmitting plural data packets simultaneously between said two STAs using plural idle radio channels.

(2) A wireless packet communication method transmitting a data packet between two STAs capable of using plural radio channels, by using a radio channel that is judged idle by carrier sensing, characterized by:

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

generating plural data packets having a same packet time length; and

transmitting plural data packets having the same packet time length simultaneously between said two STAs using plural idle radio channels.

(3) A wireless packet communication method transmitting a data packet between two STAs capable of using plural radio channels and setting transmission rates for respective radio channels, by using a radio channel that is judged idle by carrier sensing, characterized by:

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

generating plural data packets having a same packet time length in accordance with transmission rates of plural idle radio channels; and

transmitting plural data packets having the same packet time length simultaneously

between said two STAs using plural idle radio channels.

(4) A wireless packet communication method transmitting a data packet between two STAs capable of using plural radio channels and setting transmission rates for respective radio channels, by using a radio channel that is judged idle by carrier sensing, characterized by:

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

setting transmission rates of plural idle radio channels to a same transmission rate;

generating plural data packets having a same packet time length; and

transmitting plural data packets having the same packet time length simultaneously between said two STAs using plural idle radio channels.

(5) The wireless packet communication method according to claim 4, characterized by:

setting said transmission rates of said plural idle radio channels equal to a lowest one of said transmission rates.

(6) A wireless packet communication method transmitting a data packet between two STAs capable of using MIMO, by using a radio channel that is judged idle by carrier sensing, characterized by:

when it is detected by said carrier sensing that at least one radio channel is idle,

generating plural data packets having a same packet time length; and

transmitting plural data packets having the same packet time length simultaneously between said two STAs using one idle radio channel and said MIMO.

(7) The wireless packet communication method according to any one of claims 1-5, characterized by:

transmitting plural data packets having a same packet time length simultaneously between said two STAs using plural idle radio channels and said MIMO, the plural data

packets being in a number that is equal to a sum of MIMO numbers of plural respective radio channels, and said STAs capable of using plural radio channels and MIMO together.

(8) The wireless packet communication method according to any one of claims 1-7, characterized in that:

while said STA itself is performing a transmission on at least one radio channel,

said STA selects, from idle radio channels, a radio channel or channels that is not influenced from leakage power from said radio channel being used for said transmission.

(9) The wireless packet communication method according to any one of claims 1-7, characterized in that:

while said STA itself is performing a transmission on at least one radio channel,

said STA defers any transmission process including carrier sensing until completion of said transmission.

(10) The wireless packet communication method according to any one of claims 1-5, characterized in that:

said STA simultaneously transmits data packets generated from all transmission-standby data frames when a number of transmission-standby data frames is smaller than or equal to a number of idle channels; and

said STA generates and simultaneously transmits a same number of data packets as the idle radio channels when the number of transmission-standby data frames exceeds the number of idle radio channels.

(11) The wireless packet communication method according to any one of claims 1-5, characterized in that:

when a number K of transmission-standby data frames exceeds the number N of idle channels,

said STA waits until a relationship $N \geq K$ is satisfied, all radio channels become idle

before said relationship $N \geq K$ is satisfied, a prescribed time elapses before said relationship $N \geq K$ is satisfied, or the number or a data size of transmission-standby data frames reaches a prescribed value before said relationship $N \geq K$ is satisfied; and then

generates and simultaneously transmits data packets in a number according to the number of idle radio channels.

(12) The wireless packet communication method according to any one of claims 1-5, characterized in that:

when a number K of transmission-standby data frames is smaller than a number N of idle channels,

said STA waits until a relationship $N = K$ is satisfied, a prescribed time elapses before said relationship $N = K$ is satisfied, or the number or a data size of transmission-standby data frames reaches a prescribed value before said relationship $N = K$ is satisfied; and then

generates and simultaneously transmits plural data packets.

(13) The wireless packet communication method according to claim 6, characterized in that:

said STA simultaneously transmits data packets generated from all transmission-standby data frames when a number of transmission-standby data frames is smaller than or equal to a MIMO number; and

said STA generates and simultaneously transmits a same number of data packets as said MIMO number when the number of transmission-standby data frames exceeds said MIMO number.

(14) The wireless packet communication method according to claim 7, characterized in that:

said STA simultaneously transmits data packets generated from all transmission-standby data frames when the number of transmission-standby data frames is

smaller than or equal to the number of simultaneous transmissions, the number of simultaneous transmission being said sum of said MIMO numbers of said plural respective radio channels; and

generates and simultaneously transmits a same number of data packets as said number of simultaneous transmissions when the number of transmission-standby data frames exceeds said number of simultaneous transmissions.

(15) The wireless packet communication method according to claim 7, characterized in that:

when a number K of transmission-standby data frames exceeds a number of simultaneous transmissions T, the number of simultaneous transmissions T being said sum of said MIMO numbers of said plural respective radio channels,

said STA waits until a relationship $T \geq K$ is satisfied, all radio channels become idle before said relationship $T \geq K$ is satisfied, a prescribed time elapses before said relationship $T \geq K$ is satisfied, or a number or a data size of transmission-standby data frames reaches a prescribed value before said relationship $T \geq K$ is satisfied; and then

said STA generates and simultaneously transmits data packets in a number according to the number of simultaneous transmissions.

(16) The wireless packet communication method according to claim 7, characterized in that:

when a number K of transmission-standby data frames is smaller than a number of simultaneous transmissions T, the number of simultaneous transmissions T being said sum of said MIMO numbers of said plural respective radio channels,

said STA waits until a relationship $T = K$ is satisfied, a prescribed time elapses before said relationship $T = K$ is satisfied, or a number or a data size of transmission-standby data frames reaches a prescribed value before said relationship $T = K$ is satisfied; and then

said STA generates and simultaneously transmits plural data packets.

(17) The wireless packet communication method according to claim 7, characterized in that:

said STA selects one of a first mode in which a single radio channel is used and MIMO is not used, a second mode in which a single radio channel and MIMO are used, a third mode in which plural radio channels are used and MIMO is not used, and a fourth mode in which plural radio channels and MIMO are used, the selecting by the STA done according to at least one of the number of idle channels, a MIMO number of each radio channel, and a number of transmission-standby data frames.

(18) A wireless packet communication apparatus for transmitting a data packet between two STAs capable of using plural radio channels, by using a radio channel that is judged idle by carrier sensing, characterized in that it comprises:

transmission buffer block that temporarily holds data frames to be transmitted, holds information regarding stored data packets that correlates address information of data frames it holds with packet sizes, and reads out and outputs a requested data packet when receiving a packet sending request;

channels' occupation status analyzing block that acquires pieces of idle state judgment information of a predetermined plural number of respective radio channels;

data packet generating block that extracts a data region or regions from one or plural received data frames, generates plural data blocks having a same packet time length, and generates data packets by adding necessary header information to said data blocks;

packet switching block that correlates said data packets generated by said data packet generating block with radio channels to be used for transmission, respectively; and

data frame management block that determines one or plural data frames from which to generate data packets on the basis of pieces of information relating to respective data

frames that are communicated from said transmission buffer block and information relating to radio channels that is communicated from said channels' occupation status analyzing block, and the data frame management block determines a method to generate plural data packets from one or plural data frames in accordance with the number of idle radio channels, determines radio channels on which to transmit said plural generated data packets, gives said transmission buffer block designation of a data frame or frames to be output, informs said data packet generating block of a method generating data packets from one or plural data frames that are output from said transmission buffer block, and communicates, to said packet switching block, information that is necessary for correlating said data packets with said radio channels, said wireless packet communication apparatus further characterized in that

plural data packets are transmitted simultaneously between said two STAs by using plural idle radio channels.

(19) The wireless packet communication apparatus according to claim 18, characterized in that it further comprises:

a MIMO block that transmits plural independent signals simultaneously on said respective radio channels.

(20) The wireless packet communication apparatus according to claim 18 or 19, characterized in that:

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

said data frame management block performs a control to generate plural data packets having a same packet time length from one or plural data frames.

(21) The wireless packet communication apparatus according to claim 18 or 19, characterized in that:

said two STAs include means capable of setting transmission rates for respective radio channels; and

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

said data frame management block performs a control to generate plural data packets having a same packet time length from one or plural data frames, in accordance with transmission rates of plural idle radio channels.

(22) The wireless packet communication apparatus according to claim 18 or 19, characterized in that:

said two STAs include means capable of setting transmission rates for respective radio channels; and

when it is detected by said carrier sensing that plural radio channels are idle at the same time,

said data frame management block performs a control to set transmission rates of plural idle radio channels to a same transmission rate and to generate plural data packets having the same packet time length from one or plural data frames.

(23) The wireless packet communication apparatus according to claim 18 or 19, characterized in that it further comprises:

while an own station is performing a transmission on at least one radio channel,

means to select, from idle radio channels, a radio channel or channels that is not influenced by leakage power from said radio channel being used for said transmission.

(24) The wireless packet communication apparatus according to claim 18 or 19, characterized in that it further comprises:

while an own station is performing a transmission on at least one radio channel,

means to prohibit any transmission process including carrier sensing until

completion of said transmission.

(25) The wireless packet communication apparatus according to claim 19, characterized in that:

said data frame management block includes means that selects one of a first mode in which a single radio channel is used and MIMO is not used, a second mode in which a single radio channel and MIMO are used, a third mode in which plural radio channels are used and MIMO is not used, and a fourth mode in which plural radio channels and MIMO are used, the selecting by the means done according to at least one of the number of idle channels, a MIMO number of each radio channel, and the number of transmission-standby data frames.